

Claims

1. A concentrated aqueous polymer dispersion with an average particle size of less than 1000 nm comprising

- 5 a) a polymer carrier prepared by heterophase radical polymerization of at least one ethylenically unsaturated monomer in the presence of
 b) a non-polar organic light stabilizer,

10 wherein the weight ratio of non-polar organic light stabilizer to polymer carrier is greater than 50 parts of light stabilizer per 100 parts of carrier.

2. A concentrated aqueous polymer dispersion according to claim 1 comprising additionally a non-ionic, cationic or anionic surfactant.

15 3. A concentrated aqueous polymer dispersion according to claim 1 wherein the weight ratio of non-polar organic light stabilizer to polymer carrier is equal or greater than 80 parts per 100 parts.

20 4. A concentrated aqueous polymer dispersion according to claim 1 wherein the average particle size is less than 500 nm.

25 5. A concentrated aqueous polymer dispersion according to claim 1 wherein the non-polar organic light stabilizer is selected from the group consisting of a hydroxyphenyl benzotriazol UV-absorber, a hydroxyphenyl triazine UV-absorber, a hydroxybenzophenone UV-absorber, an oxalic anilide UV-absorber and a sterically hindered amine light stabilizer or mixtures thereof.

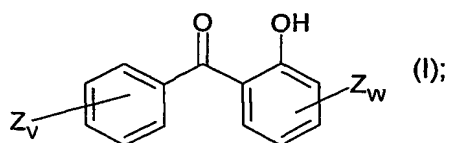
30 6. A concentrated aqueous polymer dispersion according to claim 1 wherein the non-polar organic light stabilizer has a water solubility of less than 1 % by weight at room temperature and atmospheric pressure.

7. A concentrated aqueous polymer dispersion according to claim 1 wherein the ethylenically unsaturated monomer is selected from the group consisting of C₁-C₁₈acrylates, C₁-C₁₈methacrylates, acrylic acid, (meth)acrylic acid, styrene, vinyltoluene, hydroxy-functional

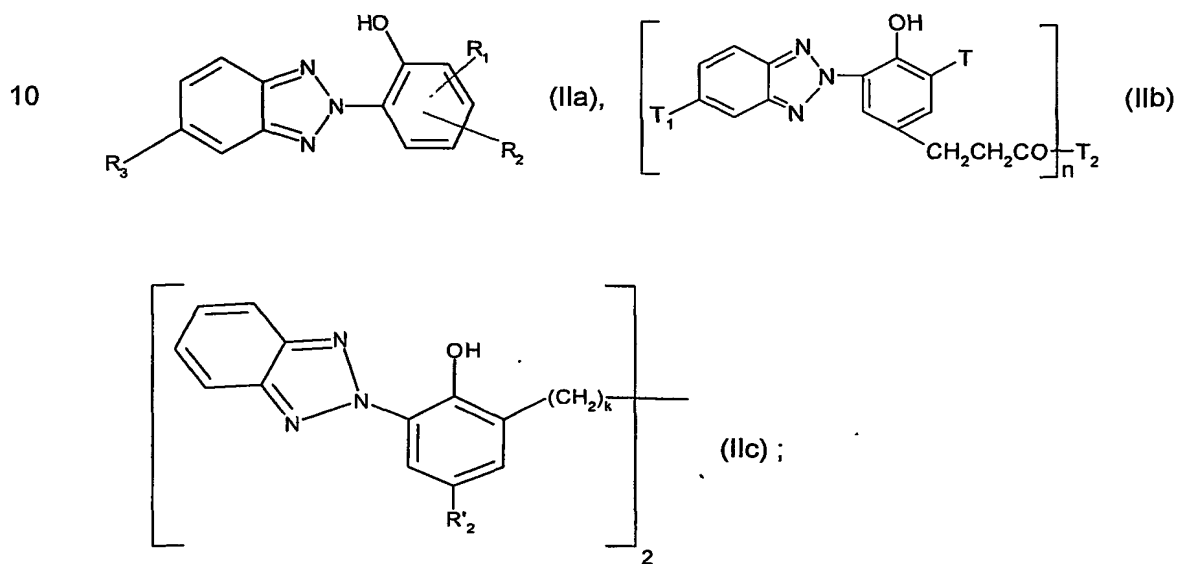
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acrylates or (meth)acrylates, acrylates or (meth)acrylates derived from alkoxyated alcohols and multifunctional acrylates or (meth)acrylates or mixtures thereof.

8. A concentrated aqueous polymer dispersion according to claim 5 wherein the hydroxybenzophenone is of formula I



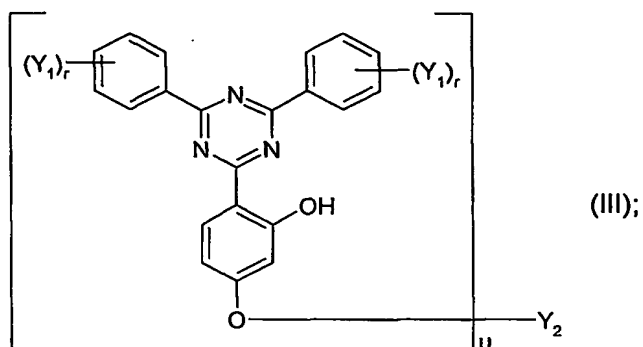
the 2-hydroxyphenylbenzotriazole is of formula IIa, IIb or IIc



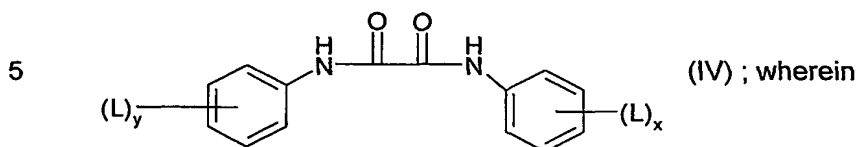
the 2-hydroxyphenyltriazine is of formula III

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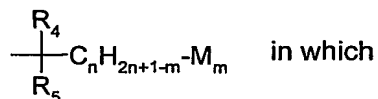
and the oxanilide is of formula (IV)



in the compounds of the formula (I) v is an integer from 1 to 3 and w is 1 or 2 and the substituents Z independently of one another are hydrogen, halogen, hydroxyl or alkoxy having 1 to 12 carbon atoms;

10 in the compounds of the formula (IIa),

R_1 is hydrogen, alkyl having 1 to 24 carbon atoms, phenylalkyl having 1 to 4 carbon atoms in the alkyl moiety, cycloalkyl having 5 to 8 carbon atoms or a radical of the formula



R_4 and R_5 independently of one another are alkyl having in each case 1 to 5 carbon atoms, or R_4 , together with the radical $C_n H_{2n+1-m}$, forms a cycloalkyl radical having 5 to 12 carbon atoms,

m is 1 or 2, n is an integer from 2 to 20 and

M is a radical of the formula $-COOR_6$ in which

R_6 is hydrogen, alkyl having 1 to 12 carbon atoms, alkoxyalkyl having in each case 1 to 20 carbon atoms in the alkyl moiety and in the alkoxy moiety or phenylalkyl having 1 to 4 carbon atoms in the alkyl moiety,

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R₂ is hydrogen, halogen, alkyl having 1 to 18 carbon atoms, and phenylalkyl having 1 to 4 carbon atoms in the alkyl moiety, and

R₃ is hydrogen, chlorine, alkyl or alkoxy having in each case 1 to 4 carbon atoms or -COOR₆ in which R₆ is as defined above, at least one of the radicals R₁ and R₂ being other than hydrogen;

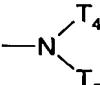
in the compounds of the formula (IIb)

T is hydrogen or alkyl having 1 to 6 carbon atoms,

T₁ is hydrogen, chlorine or alkyl or alkoxy having in each case 1 to 4 carbon atoms,

10 n is 1 or 2 and,

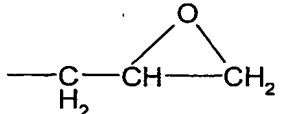
if n is 1,

T₂ is chlorine or a radical of the formula -OT₃ or  and,

if n is 2, T₂ is a radical of the formula  or -O-T₉-O-;

in which

15 T₃ is hydrogen, alkyl which has 1 to 18 carbon atoms and is unsubstituted or substituted by 1 to 3 hydroxyl groups or by -OCOT₆, alkyl which has 3 to 18 carbon atoms, is interrupted once or several times by -O- or -NT₆- and is unsubstituted or substituted by hydroxyl or -OCOT₆, cycloalkyl which has 5 to 12 carbon atoms and is unsubstituted or substituted by hydroxyl and/or alkyl having 1 to 4 carbon atoms, alkenyl which has 2 to 18 carbon atoms and is
20 unsubstituted or substituted by hydroxyl, phenylalkyl having 1 to 4 carbon atoms in the alkyl

moiety, or a radical of the formula -CH₂CH(OH)-T₇ or 

T₄ and T₅ independently of one another are hydrogen, alkyl having 1 to 18 carbon atoms, alkyl which has 3 to 18 carbon atoms and is interrupted once or several times by -O- or -NT₆-, cycloalkyl having 5 to 12 carbon atoms, phenyl, phenyl which is substituted by alkyl
25 having 1 to 4 carbon atoms, alkenyl having 3 to 8 carbon atoms, phenylalkyl having 1 to 4 carbon atoms in the alkyl moiety or hydroxyalkyl having 2 to 4 carbon atoms,

T₆ is hydrogen, alkyl having 1 to 18 carbon atoms, cycloalkyl having 5 to 12 carbon atoms,

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alkenyl having 3 to 8 carbon atoms, phenyl, phenyl which is substituted by alkyl having 1 to 4 carbon atoms, phenylalkyl having 1 to 4 carbon atoms in the alkyl moiety,

T₇ is hydrogen, alkyl having 1 to 18 carbon atoms, phenyl which is unsubstituted or substituted by hydroxyl, phenylalkyl having 1 to 4 carbon atoms in the alkyl moiety, or -

5 CH₂OT₈,

T₈ is alkyl having 1 to 18 carbon atoms, alkenyl having 3 to 8 carbon atoms, cycloalkyl having 5 to 10 carbon atoms, phenyl, phenyl which is substituted by alkyl having 1 to 4 carbon atoms, or phenylalkyl having 1 to 4 carbon atoms in the alkyl moiety,

10 T₉ is alkylene having 2 to 8 carbon atoms, alkenylene having 4 to 8 carbon atoms, alkynylene having 4 carbon atoms, cyclohexylene, alkylene which has 2 to 8 carbon atoms and is interrupted once or several times by -O-, or a radical of the formula -CH₂CH(OH)CH₂OT₁₁OCH₂CH(OH)CH₂- or -CH₂-C(CH₂OH)₂-CH₂-,

T₁₀ is alkylene which has 2 to 20 carbon atoms and can be interrupted once or several times by -O-, or cyclohexylene,

15 T₁₁ is alkylene having 2 to 8 carbon atoms, alkylene which has 2 to 18 carbon atoms and is interrupted once or several times by -O-, 1,3-cyclohexylene, 1,4-cyclohexylene, 1,3-phenylene or 1,4-phenylene, or

T₁₀ and T₆, together with the two nitrogen atoms, are a piperazine ring;

20 in the compounds of formula (IIc)

R'₂ is C₁-C₁₂alkyl and k is a number from 1 to 4;

in the compounds of the formula (III)

u is 1 or 2 and r is an integer from 1 to 3, the substituents

25 Y₁ independently of one another are hydrogen, hydroxyl, phenyl or halogen, halogenomethyl, alkyl having 1 to 12 carbon atoms, alkoxy having 1 to 18 carbon atoms, alkoxy having 1 to 18 carbon atoms which is substituted by a group -COO(C₁-C₁₈alkyl);

if u is 1,

30 Y₂ is alkyl having 1 to 18 carbon atoms, phenyl which is unsubstituted or substituted by hydroxyl, halogen, alkyl or alkoxy having 1 to 18 carbon atoms;

alkyl which has 1 to 12 carbon atoms and is substituted by -COOH, -COOY₈, -CONH₂, -CONHY₉, -CONY₉Y₁₀, -NH₂, -NHY₉, -NY₉Y₁₀, -NHCOY₁₁, -CN and/or -OCOY₁₁;

alkyl which has 4 to 20 carbon atoms, is interrupted by one or more oxygen atoms and is unsubstituted or substituted by hydroxyl or alkoxy having 1 to 12 carbon atoms, alkenyl

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having 3 to 6 carbon atoms, glycidyl, cyclohexyl which is unsubstituted or substituted by hydroxyl, alkyl having 1 to 4 carbon atoms and/or $-\text{OCOY}_{11}$, phenylalkyl which has 1 to 5 carbon atoms in the alkyl moiety and is unsubstituted or substituted by hydroxyl, chlorine and/or methyl, $-\text{COY}_{12}$ or $-\text{SO}_2\text{Y}_{13}$, or,

5 if u is 2,

Y_2 is alkylene having 2 to 16 carbon atoms, alkenylene having 4 to 12 carbon atoms, xylylene, alkylene which has 3 to 20 carbon atoms, is interrupted by one or more $-\text{O}-$ atoms and/or is substituted by hydroxyl, $-\text{CH}_2\text{CH}(\text{OH})\text{CH}_2-\text{O}-\text{Y}_{15}-\text{OCH}_2\text{CH}(\text{OH})\text{CH}_2-$, $-\text{CO}-\text{Y}_{16}-\text{CO}-$, $-\text{CO}-\text{NH}-\text{Y}_{17}-\text{NH}-\text{CO}-$ or $-(\text{CH}_2)_m-\text{CO}_2-\text{Y}_{18}-\text{OCO}-(\text{CH}_2)_m$, in which

10 m is 1, 2 or 3,

Y_8 is alkyl having 1 to 18 carbon atoms, alkenyl having 3 to 18 carbon atoms, alkyl which has 3 to 20 carbon atoms, is interrupted by one or more oxygen or sulfur atoms or $-\text{NT}_6-$ and/or is substituted by hydroxyl, alkyl which has 1 to 4 carbon atoms and is substituted by $-\text{P}(\text{O})(\text{OY}_{14})_2$, $-\text{NY}_9\text{Y}_{10}$ or $-\text{OCOY}_{11}$ and/or hydroxyl, alkenyl having 3 to 18 carbon atoms, glycidyl, or phenylalkyl having 1 to 5 carbon atoms in the alkyl moiety,

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Y_9 and Y_{10} independently of one another are alkyl having 1 to 12 carbon atoms, alkoxyalkyl having 3 to 12 carbon atoms, dialkylaminoalkyl having 4 to 16 carbon atoms or cyclohexyl having 5 to 12 carbon atoms, or Y_9 and Y_{10} together are alkylene, oxaalkylene or azaalkylene having in each case 3 to 9 carbon atoms,

20 Y_{11} is alkyl having 1 to 18 carbon atoms, alkenyl having 2 to 18 carbon atoms or phenyl,

Y_{12} is alkyl having 1 to 18 carbon atoms, alkenyl having 2 to 18 carbon atoms, phenyl, alkoxy having 1 to 12 carbon atoms, phenoxy, alkylamino having 1 to 12 carbon atoms or phenylamino,

25 Y_{13} is alkyl having 1 to 18 carbon atoms, phenyl or alkylphenyl having 1 to 8 carbon atoms in the alkyl radical,

Y_{14} is alkyl having 1 to 12 carbon atoms or phenyl,

Y_{15} is alkylene having 2 to 10 carbon atoms, phenylene or a group $-\text{phenylene}-\text{M}-\text{phenylene}-$ in which M is $-\text{O}-$, $-\text{S}-$, $-\text{SO}_2-$, $-\text{CH}_2-$ or $-\text{C}(\text{CH}_3)_2-$,

30 Y_{16} is alkylene, oxaalkylene or thiaalkylene having in each case 2 to 10 carbon atoms, phenylene or alkenylene having 2 to 6 carbon atoms,

Y_{17} is alkylene having 2 to 10 carbon atoms, phenylene or alkylphenylene having 1 to 11 carbon atoms in the alkyl moiety, and

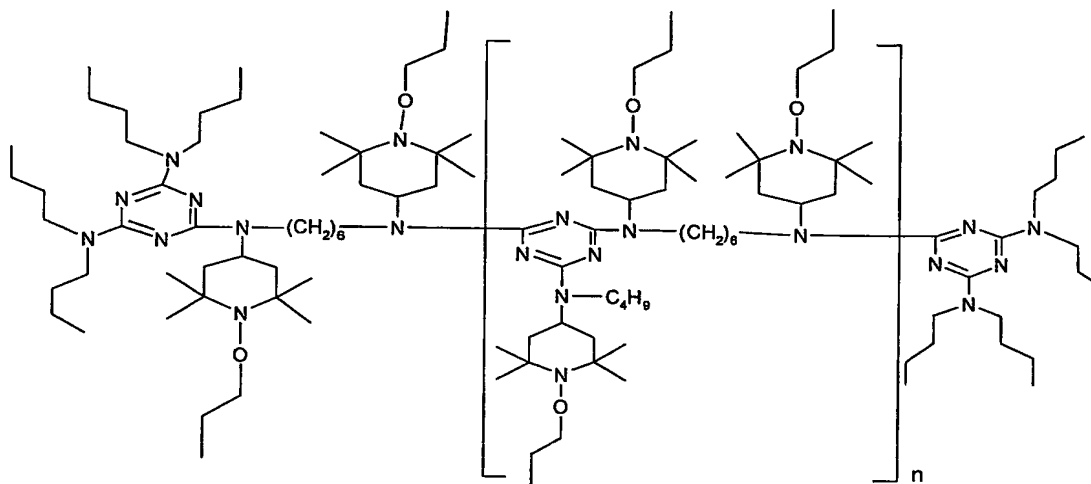
Y_{18} is alkylene having 2 to 10 carbon atoms or alkylene which has 4 to 20 carbon atoms and is interrupted once or several times by oxygen;

in the compounds of the formula (IV) x is an integer from 1 to 3 and the substituents L independently of one another are hydrogen, alkyl, alkoxy or alkylthio having in each case 1 to 22 carbon atoms, phenoxy or phenylthio.

- 5 9. A concentrated aqueous polymer dispersion according to claim 5 wherein the sterically hindered amine is selected from the group consisting of bis(2,2,6,6-tetramethyl-4-piperidyl)sebacate, bis(2,2,6,6-tetramethyl-4-piperidyl)succinate, bis(1,2,2,6,6-pentamethyl-4-piperidyl)sebacate, bis(1-octyloxy-2,2,6,6-tetramethyl-4-piperidyl)sebacate, bis(1,2,2,6,6-pentamethyl-4-piperidyl) n-butyl-3,5-di-tert-butyl-4-hydroxybenzylmalonate, the condensate
- 10 of 1-(2-hydroxyethyl)-2,2,6,6-tetramethyl-4-hydroxypiperidine and succinic acid, linear or cyclic condensates of N,N'-bis(2,2,6,6-tetramethyl-4-piperidyl)hexamethylenediamine and 4-tert-octylamino-2,6-dichloro-1,3,5-triazine, tris(2,2,6,6-tetramethyl-4-piperidyl)nitrilotriacetate, tetrakis(2,2,6,6-tetramethyl-4-piperidyl)-1,2,3,4-butane-tetracarboxylate, 1,1'-(1,2-ethanediyl)-bis(3,3,5,5-tetramethylpiperazinone), 4-benzoyl-2,2,6,6-tetramethylpiperidine, 4-stearyloxy-
- 15 2,2,6,6-tetramethylpiperidine, bis(1,2,2,6,6-pentamethylpiperidyl)-2-n-butyl-2-(2-hydroxy-3,5-di-tert-butylbenzyl)malonate, 3-n-octyl-7,7,9,9-tetramethyl-1,3,8-triazaspiro[4.5]decan-2,4-dione, bis(1-octyloxy-2,2,6,6-tetramethylpiperidyl)succinate, linear or cyclic condensates of N,N'-bis-(2,2,6,6-tetramethyl-4-piperidyl)hexamethylenediamine and 4-morpholino-2,6-dichloro-1,3,5-triazine, the condensate of 2-chloro-4,6-bis(4-n-butylamino-2,2,6,6-
- 20 tetramethylpiperidyl)-1,3,5-triazine and 1,2-bis(3-aminopropylamino)ethane, the condensate of 2-chloro-4,6-di-(4-n-butylamino-1,2,2,6,6-pentamethylpiperidyl)-1,3,5-triazine and 1,2-bis-(3-aminopropylamino)ethane, 8-acetyl-3-dodecyl-7,7,9,9-tetramethyl-1,3,8-triazaspiro[4.5]-decane-2,4-dione, 3-dodecyl-1-(2,2,6,6-tetramethyl-4-piperidyl)pyrrolidin-2,5-dione, 3-dodecyl-1-(1,2,2,6,6-pentamethyl-4-piperidyl)pyrrolidine-2,5-dione, a mixture of 4-
- 25 hexadecyloxy- and 4-stearyloxy-2,2,6,6-tetramethylpiperidine, a condensation product of N,N'-bis(2,2,6,6-tetramethyl-4-piperidyl)hexamethylenediamine and 4-cyclohexylamino-2,6-dichloro-1,3,5-triazine, a condensation product of 1,2-bis(3-aminopropylamino)ethane and 2,4,6-trichloro-1,3,5-triazine as well as 4-butylamino-2,2,6,6-tetramethylpiperidine (CAS Reg. No. [136504-96-6]); N-(2,2,6,6-tetramethyl-4-piperidyl)-n-dodecylsuccinimid, N-(1,2,2,6,6-
- 30 pentamethyl-4-piperidyl)-n-dodecylsuccinimid, 2-undecyl-7,7,9,9-tetramethyl-1-oxa-3,8-diaza-4-oxo-spiro[4,5]decane, a reaction product of 7,7,9,9-tetramethyl-2-cycloundecyl-1-oxa-3,8-diaza-4-oxospiro [4,5]decane und epichlorohydrin, 1,1-bis(1,2,2,6,6-pentamethyl-4-piperidyloxycarbonyl)-2-(4-methoxyphenyl)ethene, N,N'-bis-formyl-N,N'-bis(2,2,6,6-tetra-

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- 1,2,2,6,6-pentamethyl-4-hydroxypiperidine, poly[methylpropyl-3-oxy-4-(2,2,6,6-tetramethyl-4-piperidyl)]siloxane and reaction product of maleic acid anhydride- α -olefin-copolymer with 2,2,6,6-tetramethyl-4-aminopiperidine, 1,2,2,6,6-pentamethyl-4-aminopiperidine, 2,4-bis[N-(1-cyclohexyloxy-2,2,6,6-tetramethylpiperidine-4-yl)-N-butyl-amino]-6-(2-hydroxyethyl)amino-1,3,5-triazine,
- 5 1-(2-Hydroxy-2-methylpropoxy)-4-octadecanoyloxy-2,2,6,6-tetramethylpiperidine, 5-(2-ethylhexanoyl)oxymethyl-3,3,5-trimethyl-2-morpholinone or a compound



in which n is from 1 to 15.

- 10 10. A process for the preparation of a concentrated aqueous polymer dispersion with an average particle size of less than 1000 nm comprising the step polymerizing at least one ethylenically unsaturated monomer in the presence of a non-polar organic light stabilizer by heterophase radical polymerization;
- 15 wherein the weight ratio of non-polar organic light stabilizer to polymer carrier formed from the ethylenically unsaturated monomer is greater than 50 parts of light stabilizer per 100 parts of polymer carrier.
11. A process according to claim 10 comprising the steps
- 20 a) dissolving, emulsifying or dispersing a non-polar organic light stabilizer in at least one ethylenically unsaturated monomer;
- b) preparing a conventional oil in water emulsion of said light stabilizer dissolved, emulsified or dispersed in at least one ethylenically unsaturated monomer;
- c) homogenizing the conventional emulsion to a miniemulsion wherein the droplets of the organic phase have an average diameter below 1000 nm;

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d) polymerizing the miniemulsion by adding a polymerization initiator;
wherein the weight ratio of non-polar organic light stabilizer to polymer carrier formed from the ethylenically unsaturated monomer is greater than 50 parts of light stabilizer per 100 parts of polymer carrier.

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12. A polymer powder obtainable by vaporizing the volatile components of the concentrated aqueous polymer dispersion according to claim 1.

10 13. A composition stabilized against thermal, oxidative or light-induced degradation which comprises,

(a) an organic material susceptible to thermal, oxidative or light induced degradation, and

(b) a concentrated aqueous polymer dispersion according to claim 1.

15 14. A composition according to claim 13 wherein the amount of component b) is from 0.1 to 40% by weight based on the weight of the solid content of component a).

15. A composition according to claim 13 wherein the organic material is a recording material.

20 16. A composition according to claim 15 wherein the recording material is a photographic material or an ink jet material.

17. A composition according to claim 15 wherein the recording material is a printed material containing the concentrated aqueous polymer dispersion in an overprint varnish.

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18. A composition according to claim 13 wherein the organic material is an adhesive, an aqueous emulsion of a natural or synthetic rubber, a water based ink or a water based coating.

30 19. A composition according to claim 18 wherein component a) is a water based coating.

20. A powder coating composition stabilized against thermal, oxidative or light-induced degradation comprising

a) a solid binder material; and

35 b) a polymer powder according to claim 12.

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21. A composition stabilized against thermal, oxidative or light-induced degradation comprising

- a) a thermoplastic polymer and
- b) a polymer powder according to claim 12.

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22. Use of a concentrated aqueous polymer dispersion according to claim 1 as stabilizer against thermal, oxidative or light-induced degradation of organic materials, which are susceptible to thermal, oxidative or light induced degradation.

10 23. Use of a polymer powder according to claim 12 as stabilizer against thermal, oxidative or light-induced degradation of a powder coating.

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